

**APPARATUS AND METHODS FOR COOLING  
SEMICONDUCTOR INTEGRATED CIRCUIT PACKAGE STRUCTURES**

**Abstract of the Disclosure**

Apparatus and methods are provided for thermally  
5 coupling a semiconductor chip directly to a heat conducting  
device (e.g., a copper heat sink) using a thermal joint that  
provides increased thermal conductivity between the heat  
conducting device and high power density regions of the  
semiconductor chip, while minimizing or eliminating  
10 mechanical stress due to the relative displacement due to  
the difference in thermal expansion between the  
semiconductor chip and the heat conducting device.